



## DECLARATION

I, Jeong Woo LEE, of KAL Bldg. 3<sup>rd</sup> Fl., 41-3, Seosomun-dong, Jung-Gu, Seoul, Korea do hereby solemnly and sincerely declare as follows :

- 5           1. That I am well acquainted with the English and Korean languages.
2. That the following is a correct translation into English of the accompanying  
             certified copy of a Korean Patent Application No. 2002-0017842.

And I make the solemn declaration conscientiously believing the same to be true.

Seoul, May 16, 2006

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Jeong Woo LEE

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Applicant(s) : M2SYS CO., LTD

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**COMMISSIONER**

## **Patent Application**

**【Date of Submission】** April 01, 2002

**【Title of the Invention】** COVER HINGE MECHANISM OF CELLULAR PHONE

**【Applicant】**

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## **[ABSTRACT]**

### **[ABSTRACT]**

The present invention discloses a cover, which is opened and closed with respect to a main frame and the front and back surfaces are reversed, in order that a user can see a large size liquid crystal display (LCD) when the cover is closed. The present invention discloses a cover hinge device of a mobile phone comprising: a hinge cylinder 100 installed to be hinge-rotated with respect to the main frame 10; a rotation part installed in the hinge cylinder to make the cover rotate; a clutch part installed in the hinge cylinder 100 to generate a stop power. Since the cover 20 is rotated by the rotation part, the user can see the large size LCD 30 by rotating the large size LCD of the cover 20 outside when the cover 20 is closed. Thus, it suits the user's convenience. Also, the present invention has an effect of reducing the producing cost of the mobile phone since only 1 large size LCD 30 is installed in the mobile phone.

### **[REPRESENTATIVE DRAWING]**

Fig. 1

### **[INDEX WORDS]**

Mobile phone, cover, hinge

## **【SPECIFICATION】**

### **【TITLE OF INVENTION】**

COVER HINGE MECHANISM OF CELLULAR PHONE

### **【BRIEF DESCRIPTION OF THE DRAWINGS】**

5 Fig. 1 is an exploded perspective view of a cover hinge device according to the first embodiment of the present invention.

Fig. 2 is a cross-sectional view showing a combined state of a cover hinge device shown in Fig. 1.

10 Fig. 3 is a perspective view showing a closed state of a mobile phone applying a cover hinge device according to the present invention.

Fig. 4 is a perspective view showing an opened state of a cover in Fig. 3.

Fig. 5 is a perspective view showing a rotated state of a cover in Fig. 4.

Fig. 6 is a perspective view showing a closed state of a cover in Fig. 5.

15 Fig. 7 is an exploded perspective view of a cover hinge device according to the second embodiment of the present invention.

Fig. 8 is a cross-sectional view showing a combined state of a cover hinge device shown in Fig. 7.

Fig. 9 is an exploded perspective view of a cover hinge device according to the third embodiment of the present invention

20 Fig. 10 is a cross-sectional view showing a combined state of a cover hinge device shown in Fig. 9.

\*Description of the main reference number in the drawings\*

10: main frame

12: hinge hole

25 14: second corner hole

20: cover

	30: large size LCD	100: hinge cylinder
	110: rotation area	112: combining hole
	114: shaft supporting part	130, 140 and 150: hinge area
	134: second guide groove	142: first shaft hole
5	144: third guide groove	152: fourth guide groove
	154: second shaft hole	210: cylinder
	212: arm	214: first shaft hole
	220: hollow hole	222: first guide groove
	230: first compression spring	240: first rotation slip part
10	242: first through hole	244: first guide projection
	246: first slip surface	248: first ball
	250: first fixing slip part	252: first corner hole
	254: second slip surface	256: first hemispherical groove
	258: first inducing groove	260: first rotation shaft
15	262: first corner projection	264: first annular groove
	266: screw	270: first e-shaped ring
	310: second compression spring	
	320: second rotation slip part	322: third through hole
	324: third slip surface	326: second hemispherical groove
20	328: second inducing groove	330: first fixing slip part
	332: fourth through hole	334: fourth slip surface
	336: second corner projection part	338: second ball
	340: second rotation shaft	342: second annular groove
	344: clamping end	350: second e-shaped ring
25	400: third compression spring	410: third slip part

	412: fifth slip surface	414: fifth through hole
	416: third hemispherical groove	418: third inducing groove
	420: third guide projection	430: third fixing slip part
	432: third corner projection part	434: sixth slip surface
5	436: first guide shaft	440: third ball
	500: fourth compression spring	510: fourth rotation slip part
	512: seventh slip surface	514: sixth through hole
	516: fourth hemispherical groove	518: fourth inducing groove
	520: fourth guide projection	530: fourth fixing slip part
10	532: fourth corner projection part	534: eighth slip surface
	536: second guide shaft	540: fourth ball

#### **【DESCRIPTION OF THE INVENTION】**

#### **【OBJECTIVE OF THE INVENTION】**

#### **15 【FIELD OF THE INVENTION AND DESCRIPTION OF THE RELATED ART】**

The present invention relates to a cover hinge device of a mobile phone. In particular, the present invention is for a user to see a large size liquid crystal display (LCD) of the cover in an off-state of the mobile phone by making front and back surfaces of the cover inverted while the cover is opened and closed with respect to the main frame. As an  
20 example of a hinge device of a mobile phone, a patent application no. 10-1998-0046799 discloses "hinge device of a mobile phone."

Generally, a cover hinge device including the above patent application uses a hinge device as a medium part for hinge-rotating a cover (including a flip or a folder) with regard to a main frame. Such hinge device functions to maintain the current state having a  
25 certain degree of elasticity while the cover is closed and opened with respect to the main

frame.

Meanwhile, a large size LCD is installed on a surface contacted to the main frame. If the cover is closed with respect to the main frame, the user cannot see the large size LCD since the LCD is contacted to the main frame. Thus, the LCD is automatically set to be  
5 off when the mobile phone is off, and the LCD is on only if the cover is opened.

Accordingly, it is inconvenient since the user cannot see the large size LCD when the cover is closed. In addition, since a small size of LCD is installed on outer surface of the cover for displaying a text message and so on when the mobile phone is off, the producing cost increases.

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#### **【TECHNICAL MATTERS TO BE SOLVED】**

In order to resolve the above-mentioned problems, the present invention is for a user to see a large size (LCD) of the cover in an off-state of the mobile phone by making front and back surfaces of the cover inverted while the cover is opened and closed with respect to  
15 the main frame. Accordingly, the present invention suits the users convenience and reduces the producing cost of the mobile phone.

#### **【CONSTRUCTION OF THE INVENTION】**

In order to achieve the above object, the present invention provides a hinge cylinder for  
20 combining a cover in such a manner that it can be hinge-rotated with respect to the main frame; a rotation part installed in a rotation area formed in the hinge cylinder in such a manner that the cover can be rotated; and a clutch part inserted into a rotation area formed in the hinge cylinder to generate a stop force when the cover is closed and opened with respect to the main frame.

25 Hereinafter, a first embodiment of a cover hinge device of a mobile phone according to the



present invention is explained.

Fig. 1 is a exploded perspective view of a cover hinge device according to the first embodiment of the present invention, and Fig. 2 is a cross-sectional view showing a combined state of a cover hinge device in Fig. 1.

- 5 The hinge cylinder 100 of the present embodiment comprises a rotation area 110 opened upward, and a first hinge area 130 opened in a side direction and forming a horizontal second guide groove 134.

The rotation part comprises:

- 10 a cylinder 210, which forms a hollow hole 220 opened downward, which forms a first shaft hole 214 on the upper surface of the hollow hole 220, which forms a vertical first guide groove 222 on the inner surface of the hollow hole 220, and which forms an arm 212 combined with a cover 20 in its upside;

a first compression spring 230 inserted into the hollow hole 220;

- 15 a first rotation slip part 240, which forms a second shaft hole 242 in its center, which forms a first guide projection 244 slidably combined with the first guide groove 222 in its outer circumferential surface, which forms a flat first slip surface 246 in the lower direction, and which forms a pair of first balls 248 fixed on the position opposite to the second shaft hole 242 in the first slip surface 246;

- 20 a first fixing slip part 250 which forms a first corner hole 252 in its center, which forms a second slip surface 254 corresponding to the first slip surface 246, which forms a pair of hemispherical grooves 256 corresponding to the pair of the first ball 248 on the second slip surface 254, and which forms a first inducing groove 258 connecting each of the first hemispherical grooves 256 with an annular shape;

- 25 a first rotation shaft 260 which is fixed perpendicularly to the rotation area 110 to be combined with the first corner hole 252, the second shaft hole 242, the first compression

spring 230 and the first shaft hole 214, which forms an annular groove 264 on its projected end, and which forms a first corner projection part 262 combined with the first corner hole 252; and

a first e-shaped ring 270, which is combined with the first annular groove 264 in the upper part of the first shaft hole 214.

The arm 212 formed in the upper end of the cylinder 210 is to combine with the cover 20 by a screw.

A projection (not illustrated) for stopping is formed on the outer circumferential surface of the cylinder 210, and a pair of corresponding projections (not illustrated) in which the projection is clamped at an interval of  $180^\circ$  in the rotation area 110 of the hinge cylinder 100. Accordingly, wires connecting the signal of the main frame 10 and the cover 20 are prevented from getting twisted.

The first rotation shaft 260 is fixed to the rotation area 110 by using a screw 266.

Meanwhile, a clutch part 300 comprises:

a second compression spring 310, which is inserted into the hinge area 130;

a second rotation slip part 320, which is inserted into the hinge area 130 outside of a second compression spring 310, which forms a third shaft hole 322 in its center, which forms a flat third slip surface 324 in one surface, which forms two or more second hemispherical grooves 326 in the position opposite the third shaft hole 322, which forms a second inducing groove 326 connecting the second hemispherical grooves 326 with an annular shape, and which forms a second guide projection 329 slidably combined with the second guide groove 134;

a second fixing slip part 330, which is inserted into the first hinge area 130 outside of the second rotation slip part 320, which forms a fourth shaft hole 332 corresponding to the third shaft hole 322, which forms a fourth slip surface 334 corresponding to the third slip

surface 324 on its one side, which forms a pair of second balls 338 inserted into the second hemispheric groove 326 on the fourth slip surface 334, and which forms a second corner projection part 336 combined with the second corner hole 14 formed on the main frame 10 in its other side;

5 a second rotation shaft 340, which is rotatably combined with the fourth shaft hole 332, the third shaft hole 322 and the second compression spring 310, which forms a second annular groove 342 on its end, and which forms a clamping end 344 clamped with the corner projection part 336 in its back end; and

10 a second e-shaped ring 350, which is combined with the second annular groove 342 in the rotation area part 110.

Generally, a large size of LCD 30 of a mobile phone is set to be off when the cover 20 is closed with respect to the main frame 10. However, The mobile phone according to the embodiment of the present invention needs a separate sensor and control function which make the large size LCD 30 on if the LCD 30 is closed with regard to the main frame while

15 the LCD 30 is toward outside.

Hereinafter, the operation of the cover rotation device of the mobile phone comprising the above constitution is explained.

Fig. 3 is a perspective view showing a closed state of a mobile phone applying a cover hinge device according to the present invention; Fig. 4 is a perspective view showing an opened state of a cover in Fig. 3; Fig. 5 is a perspective view showing a rotated state of a cover in Fig. 4; and Fig. 6 is a perspective view showing a closed state of a cover in Fig. 5.

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The cover rotation device is installed in the mobile phone in the following manner: the cylinder 210 is fixed to the cover 20, and the first guide projection 244 of the first rotation slip part 240 is combined with the first guide groove 222 of the cylinder 210 so that the

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cover 20, cylinder 210 and the first rotation slip part 240 are integrally rotated.

The first rotation shaft 260 is fixed to the rotation area 110 of the hinge cylinder 100, and the first corner hole 252 of the first fixing slip part 250 is combined with the first corner projection part 262 of the first rotation shaft 260 to prevent the rotation.

- 5 The first compression spring 230 elastically supports the first rotation slip part 240 in the outer direction so that the first slip surface 246 elastically contacts to the second slip surface 246 of the first fixing slip part 250.

- Meanwhile, the second corner projection part 336 of the second fixing slip part 330 is combined with the second corner hole 14 of the main frame 10. A shaft supporting part  
10 114 is combined with the combining hole 112 formed on the other side of the hinge cylinder 100, and the other side of the shaft supporting part 114 is inserted into the hinge hole 12 to make the hinge cylinder 100 rotate. Also, the second compression spring 310 elastically supports the second rotation slip part 330 in the outer direction so that the third slip surface 324 is elastically contacted to the fourth slip surface 334 of the second fixing  
15 slip part 330.

- Meanwhile, the large LCD 30 is installed on the surface in which the cover 30 contacts to the main frame 10. When the cover is closed with respect to the main frame 10, the user cannot see the large size of the cover 20. If user wants to see the large size LCD 30 when the mobile phone is off, the cover is rotated to be opened around the rotation axis, which  
20 is the hinge cylinder 100. When the cover 20 starts to be opened, the hinge cylinder 100 is rotated simultaneously. At this time, the second rotation slip part 320 inserted into the first hinge area 130 of the hinge cylinder 100 is crossed with the second slip part 330 fixed to the main frame 10 while the second ball 338 fixed to the fourth slip surface 334 of the second fixing slip part 330 is released from the second hemispherical groove 326 formed  
25 on the third slip surface 324 of the second rotation slip part 330 and moves along the

second inducing groove 328.

The second compression spring 310 is compressed at its maximum at this time.

Thereafter, when the cover 20 is opened until the angle capable of calling, the second ball 338 is inserted into the other second hemispheric groove 326 formed on the third slip surface 324. Then, the restoring force of the second compression spring 310 increases thereby elastically supporting the second rotation slip part 320.

During such operation, the second rotation shaft 340 is inserted into the fourth through hole 332 of the second fixing slip part 330 and the third through hole 322 of the second slip part 320 to firmly support the center so that the first fixing slip part 320 and the first rotation slip part 330 can smoothly operate. The second guide projection 329 of the second rotation slip part 320 is inserted into the second guide groove 134 of the hinge cylinder 100 to prevent rotating, and the first fixing slip part 320 moves only straightly. Meanwhile, if the cover is rotated to one direction while being opened, the cylinder 210 fixed to the cover 20 is rotated integrally with the cover 20.

Accordingly, the cylinder 210 and the first rotation slip part 240 are rotated together with the cover 20, and the first fixing slip part 250, which is combined with the first center shaft 260 fixed to the rotation area 110 of the hinge cylinder 100 combined with the main frame 10, is not rotated.

Thus, as the first rotation slip part 240 is crossed with the first fixing slip part 250, the first ball 248 fixed to the first slip surface 246 of the first rotation slip part 240 is released from the first hemispherical groove 256 formed on the second slip surface 254 of the first fixing slip part 250 and moves along the first inducing groove 258. At this time, the first compression spring 230 is compressed at its maximum.

Thereafter, if the cover 20 is rotated at an angle of 180°, the first ball 248 is inserted into the other first hemispherical groove 256 formed on the second slip surface 254. Then,

the restoring force of the first compression spring 230 increases to elastically support the first rotation slip part 240.

In this operation, the first rotation shaft 120 is inserted into the corner hole 252 of the first fixing slip part 250 and the second through hole 242 of the first rotation slip part 240 to support the center fixedly so that the operation of the first rotation slip part 240 and the first fixing slip part 250 can be smoothly performed. The guide projection 244 of the first rotation slip part 240 is inserted into the first guide groove 222 of the cylinder to prevent rotation and only moves straightly.

The projection of the cylinder 210 is clamped with the corresponding projection of the hinge cylinder 100 to prevent an excessive rotation of the cylinder 210.

In this state, when the user rotates the cover 20 to close it with respect to the main frame 10, the large size LCD 30 of the cover 20 faces outside. Thus, the user can see the large LCD 30 when the cover is closed.

When the user does not see the large size LCD 30 of the cover 20, the above process is performed in reverse so that the cover 20 can be closed with respect to the main frame 10 by rotating the large size LCD 30 of the cover 20 to face the main frame 10.

Hereinafter, the second embodiment of the present invention is explained.

Fig. 7 is an exploded perspective view of a cover hinge device according to the second embodiment of the present invention, and Fig. 8 is a cross-sectional view showing a combined state of a cover hinge device shown in Fig. 7.

The hinge cylinder 100 of the present embodiment comprises a rotation area 110 opened upward, and a second rotation area 140 which is opened upward, which forms a third guide groove 144 starting vertically and bent horizontally in a lower direction on its both sides, and which forms a first through hole 142 opposite to the rotation area 110.

The rotation part comprises:

a cylinder, which forms a hollow hole 220 opened downward, which forms a first shaft hole 214 on upper surface of the hollow hole 220, which forms a horizontal first guide groove 222 on inner surface of the hollow hole, and which forms an arm 212 combined with a cover 20 in an upper direction;

5 a first compression spring 230, which is inserted into the hollow hole 220;

a first rotation slip part 240, which forms a second shaft hole 242 in its center, which forms a first guide projection 244 slidably combined with the first guide groove 222 in its outer circumferential surface, which forms a flat first slip surface 246 in a lower direction, which forms a pair of first balls 248 in the position opposite to the second shaft hole 242 on the  
10 first slip surface;

a first slip part 250, which forms a first corner hole 252 in its center, which forms a second slip surface 254 corresponding to the first slip surface 246, which forms a pair of hemispherical grooves 256 in the position corresponding to the pair of balls 248, and which forms a first inducing groove 258 connecting each of the first hemispherical grooves  
15 246 with an annular shape;

a first rotation shaft 260, which is rotatably combined with the first corner hole 252, the second shaft hole 242, the first compression spring 230 and the first shaft hole 214, which forms a first annular groove 264 on its projected end, which forms a first corner projection part combined with the first corner hole 252; and

20 a first e-shaped ring 270, which is combined with the first annular groove 264 in the upper direction of the first shaft hole 214.

The arm 212 formed on the upper end of the cylinder 219 is to be combined with the cover 20 by a screw.

A projection (not illustrated) for stopping is formed on the outer circumferential surface of  
25 the cylinder 210, and a pair of corresponding projections (not illustrated) in which the

projection is clamped at an interval of 180° in the rotation area 110 of the hinge cylinder 100. Accordingly, the cylinder 210 can be rotated to 180° repeatedly centering the rotating shaft 260, thereby preventing wires connecting the signal of the main frame 10 and the cover 20 from getting twisted.

5 The first rotation shaft 260 is fixed to the rotation area 110 by using a screw 266.

The clutch part comprises:

a third compression spring 400, which is inserted into the second rotation area 140;

a rotation slip part 410, which is inserted into the second rotation area 140 outside of the third compression spring 400, which forms a fifth shaft hole 414 is formed on its center,

10 which forms a flat fifth slip surface on its one side, which forms two or more third hemispherical groove 416 in the position opposite to the fifth shaft hole 414, which forms a third inducing groove 418 connecting each of the third hemispherical groove 416 with an annular shape, and which forms a third guide projection slidably combined with a third guide groove 144; and

15 a third slip part, which is inserted into the second rotation area 140 outside of the third rotation slip part 410, which forms a first guide shaft rotatably combined with the fifth shaft hole in its center, which forms a sixth slip surface corresponding to the fifth slip surface 412 on its one side, which forms a pair of third balls 440 inserted into the third hemispherical groove 416 on the fifth slip surface 434, and which forms a third corner projection part 432 combined with a second corner hole 14 passing through the first through hole 142 to be formed on the main frame 10.

Generally, the large size LCD is automatically set to be off when the mobile phone is closed with respect to the main frame. However, The mobile phone according to the embodiment of the present invention needs a separate sensor and control function which  
25 make the large size LCD 30 on if the LCD 30 is closed with regard to the main frame while



the LCD 30 is toward outside.

Hereinafter, the operation of the cover rotation device of the mobile phone comprising the above constitution is explained.

Fig. 3 is a perspective view showing a closed state of a mobile phone applying a cover hinge device according to the present invention; Fig. 4 is a perspective view showing an opened state of a cover in Fig. 3, Fig. 5 is a perspective view showing a rotated state of a cover in Fig. 4, and Fig. 6 is a perspective view showing a closed state of a cover in Fig. 5.

The cover rotation device is installed in the mobile phone in the following manner: the cylinder 210 is fixed to the cover 20, and the first guide projection 244 of the first rotation slip part 240 is combined with the first guide groove 222 of the cylinder 210 so that the cover 20, cylinder 210 and the first rotation slip part 240 are integrally rotated.

The first rotation shaft 260 is fixed to the rotation area 110 of the hinge cylinder 100, and the first corner hole 252 of the first fixing slip part 250 is combined with the first corner projection part 262 of the first rotation shaft 260 to prevent the rotation.

The first compression spring 230 elastically supports the first rotation slip part 240 in the outer direction so that the first slip surface 246 elastically contacts to the second slip surface 246 of the first fixing slip part 250.

Meanwhile, the third corner projection part 432 of the third fixing slip part 430 is combined with the second corner hole 14 of the main frame 10 passing the first shaft hole 142 of the hinge cylinder. A shaft supporting part 114 is combined with the combining hole 112 formed on the other side of the hinge cylinder 100, and the other side of the shaft supporting part 114 is inserted into the hinge hole 12 to make the hinge cylinder 100 rotate. Also, the third compression spring 400 elastically supports the third rotation slip part 410 in the outer direction so that the fifth slip surface 412 is elastically contacted to

the sixth slip surface 434 of the third fixing slip part 430.

The third corner projection part 432 of the third fixing slip part 430 is combined with the second corner hole 13 of the main frame 10 to prevent rotation. Also, the shaft supporting part 114 is combined with the combining hole 112 formed on the other side of the hinge cylinder 100, and the other side of the shaft supporting part 114 is inserted into the hinge hole 12 to make the hinge cylinder 100 rotate

Meanwhile, the large LCD 30 is installed on the surface in which the cover 30 contacts to the main frame 10. When the cover is closed with respect to the main frame 10, the user cannot see the large size of the cover 20. If user wants to see the large size LCD 30 when the mobile phone is off, the cover is rotated to be opened around the rotation axis, which is the hinge cylinder 100. When the cover 20 starts to be opened, the hinge cylinder 100 is rotated simultaneously. At this time, the third rotation slip part 410 inserted into the first hinge area 130 of the hinge cylinder 100 is crossed with the third fixing slip part 430 fixed to the main frame 10 while the third ball 440 fixed to the sixth slip surface 434 of the third fixing slip part 430 is released from the third hemispherical groove 426 formed on the fifth slip surface 412 of the second rotation slip part 330 and moves along the second inducing groove 328. The third compression spring 400 is compressed at its maximum at this time.

Thereafter, when the cover 20 is opened until the angle capable of calling, the third ball 440 is inserted into the other third hemispheric groove 416 formed on the third slip surface 324. Then, the restoring force of the third compression spring 400 increases thereby elastically supporting the third rotation slip part 410.

During such operation, the first guide shaft 453 is inserted into the fifth through hole 414 of the third rotation slip part 410 to firmly support the center so that the third rotation slip part 410 and the third fixing slip part 430 can smoothly operate. The third guide projection

420 of the third rotation slip part 320 is inserted into the second guide groove 134 of the hinge cylinder 100 to prevent rotating, and the second guide projection 420 moves only straightly.

Meanwhile, if the cover is rotated to one direction while being opened, the cylinder 210  
5 fixed to the cover 20 is rotated integrally with the cover 20.

Accordingly, the cylinder 210 and the first rotation slip part 240 are rotated together with the cover 20, and the first fixing slip part 250, which is combined with the first center shaft 260 fixed to the rotation area 110 of the hinge cylinder 100 combined with the main frame 10, is not rotated.

10 Thus, as the first rotation slip part 240 is crossed with the first fixing slip part 250, the first ball 248 fixed to the first slip surface 246 of the first rotation slip part 240 is released from the first hemispherical groove 256 formed on the second slip surface 254 of the first fixing slip part 250 and moves along the first inducing groove 258. At this time, the first compression spring 230 is compressed at its maximum.

15 Thereafter, if the cover 20 is rotated at an angle of  $180^\circ$ , the first ball 248 is inserted into the other first hemispherical groove 256 formed on the second slip surface 254. Then, the restoring force of the first compression spring 230 increases to elastically support the first rotation slip part 240.

In this operation, the first rotation shaft 260 is inserted into the first corner hole 252 of the  
20 first fixing slip part 250 and the second through hole 242 of the first rotation slip part 240 to support the center fixedly so that the operation of the first rotation slip part 240 and the first fixing slip part 250 can be smoothly performed. The guide projection 244 of the first rotation slip part 240 is inserted into the first guide groove 222 of the cylinder to prevent rotation and only moves straightly.

25 The projection of the cylinder 210 is clamped with the corresponding projection of the

hinge cylinder 100 to prevent an excessive rotation of the cylinder 210.

In this state, when the user rotates the cover 20 to close it with respect to the main frame 10, the large size LCD 30 of the cover 20 faces outside. Thus, the user can see the large LCD 30 when the cover is closed.

- 5 When the user does not see the large size LCD 30 of the cover 20, the above process is performed in reverse so that the cover 20 can be closed with respect to the main frame 10 by rotating the large size LCD 30 of the cover 20 to face the main frame 10.

Hereinafter, the third embodiment of the present invention is explained.

- 10 Fig. 9 is an exploded perspective view of a cover hinge device according to the third embodiment of the present invention, and Fig. 10 is a cross-sectional view showing a combined state of a cover hinge device shown in Fig. 9.

The hinge cylinder 100 of the present embodiment comprises:

a rotation area 110 opened upward; and

- 15 **a third rotation area 150 which is opened upward, which forms a horizontal fourth guide groove 152 on its one side, which forms a second through hole 154 opposite to the rotation area 110.**

**The rotation part comprises:**

- a first guide groove, which forms a hollow hole 220 opened downward, which forms a first  
20 shaft hole on the upper surface of the hollow hole 220, which forms a vertical first guide groove 222 on inner side of the hollow hole 220, and which forms an arm 212 combined with a cover 20;
- a first compression spring 230, which is inserted into the hollow hole 220;
- a first rotation slip part, which forms a second shaft hole 242 in its center, which forms a

first guide projection 244 slidably combined with the first guide groove 222, which forms a flat first slip surface 246 on its lower part, and which forms a pair of first balls 248 in the position opposite to the second shaft hole 242;

a first fixing slip part 250, which forms a first corner hole 252, which forms a second slip surface 254 corresponding to the first slip surface 246, which forms a first hemispherical groove 256 in the position corresponding to the pair of first balls 248 on the second slip surface 254, which forms a first inducing groove 258 connecting each of the first hemispherical grooves 256 with an annular shape;

a first rotation shaft 260, which is perpendicularly fixed to the rotation 110 to rotatably combined with the first corner hole 252, the second shaft hole 242, the first compression spring 230 and the first shaft hole 214, which forms a first annular groove 264 on its projected end, and which forms a first corner projection part combined with the first corner hole 252; and

a first e-shaped ring 270, which is combined with the first annular groove 264 on the upper part of the first shaft hole 214.

The arm 212 formed on the upper end of the cylinder 219 is to be combined with the cover 20 by a screw.

A projection (not illustrated) for stopping is formed on the outer circumferential surface of the cylinder 210, and a pair of corresponding projections (not illustrated) in which the projection is clamped at an interval of  $180^\circ$  in the rotation area 110 of the hinge cylinder 100. Accordingly, the cylinder 210 can be rotated to  $180^\circ$  repeatedly centering the rotating shaft 260, thereby preventing wires connecting the signal of the main frame 10 and the cover 20 from getting twisted.

The first rotation shaft 260 is fixed to the rotation area 110 by using a screw 266.

Meanwhile, the clutch part comprises:

a fourth compression spring 500, which is inserted into the third rotation area 150;  
a fourth rotation slip part 510, which is inserted into the third rotation area 150 outside of  
the fourth compression spring 400, which forms a sixth shaft hole 514 is formed on its  
center, which forms a flat seventh slip surface 512 on its one side, which forms two or  
5 more fourth hemispherical grooves 416 in the position opposite to the sixth shaft hole 414  
on the seventh slip surface 512, which forms a fourth inducing groove 518 connecting  
each of the fourth hemispherical grooves 416 with an annular shape, and which forms a  
fourth guide projection slidably combined with a fourth guide groove 144; and  
a fourth fixing slip part 530, which is inserted into the third rotation area 150 outside of the  
10 third rotation slip part 410, which forms a second guide shaft 556 rotatably combined with  
the sixth shaft hole on its center, which forms a eighth slip surface 534 corresponding to  
the seventh slip surface 412 on its one side, which forms a pair of fourth balls 540 inserted  
into the fourth hemispherical groove 516 on the eighth slip surface 434, and which forms a  
fourth corner projection part 432 combined with a second corner hole 14 passing through  
15 the second through hole 152 to be formed on the main frame 10.

Generally, the large size LCD is automatically set to be off when the mobile phone is  
closed with respect to the main frame 10. However, The mobile phone according to the  
embodiment of the present invention needs a separate sensor and control function which  
make the large size LCD 30 on if the LCD 30 is closed with regard to the main frame while  
20 the LCD 30 is toward outside.

Hereinafter, the operation of the cover rotation device of the mobile phone comprising the  
above constitution is explained.

Fig. 3 is a perspective view showing a closed state of a mobile phone applying a cover  
25 hinge device according to the present invention; Fig. 4 is a perspective view showing an

opened state of a cover in Fig. 3; Fig. 5 is a perspective view showing a rotated state of a cover in Fig. 4; and Fig. 6 is a perspective view showing a closed state of a cover in Fig. 5.

The cover rotation device is installed in the mobile phone in the following manner: the  
5 cylinder 210 is fixed to the cover 20, and the first guide projection 244 of the first rotation slip part 240 is combined with the first guide groove 222 of the cylinder 210 so that the cover 20, cylinder 210 and the first rotation slip part 240 are integrally rotated.

The first rotation shaft 260 is fixed to the rotation area 110 of the hinge cylinder 100, and the first corner hole 252 of the first fixing slip part 250 is combined with the first corner  
10 projection part 262 of the first rotation shaft 260 to prevent the rotation. The first compression spring 230 elastically supports the first rotation slip part 240 in the outer direction so that the first slip surface 246 elastically contacts to the second slip surface 246 of the first fixing slip part 250.

Meanwhile, the fourth corner projection part 532 of the fourth fixing slip part 430 is  
15 combined with the second corner hole 14 of the main frame 10 to prevent rotating. A shaft supporting part 114 is combined with the combining hole 112 formed on the other side of the hinge cylinder 100, and the other side of the shaft supporting part 114 is inserted into the hinge hole 12 to make the hinge cylinder 100 rotate. Also, the fourth compression spring 500 elastically supports the fourth rotation slip part 510 in the outer  
20 direction so that the seventh slip surface 512 is elastically contacted to the eighth slip surface 434 of the fourth fixing slip part 530.

The fourth corner projection part 532 of the fourth fixing slip part 530 passes the second shaft hole 154 and is combined with the second corner hole 13 of the main frame 10 to prevent rotation. Also, the shaft supporting part 114 is combined with the combining hole  
25 112 formed on the other side of the hinge cylinder 100, and the other side of the shaft

supporting part 114 is inserted into the hinge hole 12 to make the hinge cylinder 100 rotate

Meanwhile, the large LCD 30 is installed on the surface of the cover 30 which contacts to the main frame 10. When the cover is closed with respect to the main frame 10, the user cannot see the large size LCD of the cover 20. If user wants to see the large size LCD 30 when the mobile phone is off, the cover is rotated to be opened around the rotation axis, which is the hinge cylinder 100.

When the cover 20 starts to be opened, the hinge cylinder 100 is rotated simultaneously.

At this time, the fourth rotation slip part 510 inserted into the third hinge area 150 of the hinge cylinder 100 is crossed with the fourth fixing slip part 530 fixed to the main frame 10 while the fourth ball 540 fixed to the eighth slip surface 534 of the fourth fixing slip part 430 is released from the fourth hemispherical groove 516 formed on the seventh slip surface 512 of the fourth rotation slip part 330 and moves along the fourth inducing groove 518. The fourth compression spring 500 is compressed at its maximum at this time.

Thereafter, when the cover 20 is opened until the angle capable of calling, the fourth ball 540 is inserted into the other fourth hemispheric groove 516 formed on the seventh slip surface 324. Then, the restoring force of the fourth compression spring 500 increases thereby elastically supporting the fourth rotation slip part 510.

Meanwhile, if the cover is rotated to one direction while being opened, the cylinder 210 fixed to the cover 20 is rotated integrally with the cover 20.

Accordingly, the cylinder 210 and the first rotation slip part 240 are rotated together with the cover 20, and the first fixing slip part 250, which is combined with the first center shaft 260 fixed to the rotation area 110 of the hinge cylinder 100 combined with the main frame 10, is not rotated.

Thus, as the first rotation slip part 240 is crossed with the first fixing slip part 250, the first



ball 248 fixed to the first slip surface 246 of the first rotation slip part 240 is released from the first hemispherical groove 256 formed on the second slip surface 254 of the first fixing slip part 250 and moves along the first inducing groove 258. At this time, the first compression spring 230 is compressed at its maximum.

- 5    Thereafter, when the cover 20 is rotated at an angle of 180°, the first ball 248 is inserted into the other first hemispherical groove 256 formed on the second slip surface 254. Then, the restoring force of the first compression spring 230 increases to elastically support the first rotation slip part 240.

- 10   In this operation, the first rotation shaft 120 is inserted into the corner hole 252 of the first fixing slip part 250 and the second through hole 242 of the first rotation slip part 240 to support the center firmly so that the operation of the first rotation slip part 240 and the first fixing slip part 250 can be smoothly performed. The guide projection 244 of the first rotation slip part 240 is inserted into the first guide groove 222 of the cylinder to prevent rotation and only moves straightly.

- 15   The projection of the cylinder 210 is clamped with the corresponding projection of the hinge cylinder 100 to prevent an excessive rotation of the cylinder 210.

In this state, when the user rotates the cover 20 to close it with respect to the main frame 10, the large size LCD 30 of the cover 20 faces outside. Thus, the user can see the large LCD 30 when the cover is closed.

- 20   When the user does not see the large size LCD 30 of the cover 20, the above process is performed in reverse so that the cover 20 can be closed with respect to the main frame 10 by rotating the large size LCD 30 of the cover 20 to face the main frame 10.

#### **【EFFECT OF THE INVENTION】**

- 25   As explained above, the present invention relates to the cover hinge device of the mobile

phone comprising the hinge cylinder 100 combining the cover 20 to be hinge-rotated with respect to the main frame 100; a rotation part 200 placed in a rotation area 110 formed in the hinge cylinder 100 to make the cover 20 to be rotated; a clutch part 300 generating stop power in a state that the cover 20 is closed with respect to the main frame 10 and in  
5 a state that the cover 20 is opened with respect to the main frame 10, having an effect in which the user can see the large size LCD of the cover 20 by rotating the large size LCD 30 outside when the mobile phone is not used. Thus, it suits the user's convenience. Also, the present invention has an effect of reducing the producing cost of the mobile phone since the number of LCD 30 can be reduced.

10 Although the invention has been shown and described with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims.

**【What is claimed is】**

**【Claim 1】**

A cover hinge device of mobile phone comprising:

a hinge cylinder 100 comprising:

5 a rotation area 110 opened upward; and

a first hinge area 130 opened in a side direction and forming a horizontal  
second guide groove 134

a rotation area comprises:

10 a cylinder 210, which forms a hollow hole 220 opened downward, which  
forms a first shaft hole 214 on the upper surface of the hollow hole 220,  
which forms a vertical first guide groove 222 on the inner surface of the  
hollow hole 220, and which forms an arm 212 combined with a cover 20  
in its upside;

a first compression spring 230 inserted into the hollow hole 220;

15 a first rotation slip part 240, which forms a second shaft hole 242 in its  
center, which forms a first guide projection 244 slidably combined with the  
first guide groove 222 in its outer circumferential surface, which forms a  
flat first slip surface 246 in the lower direction, and which forms a pair of  
first balls 248 fixed on the position opposite to the second shaft hole 242  
20 in the first slip surface 246;

a first fixing slip part 250 which forms a first corner hole 252 in its center,  
which forms a second slip surface 254 corresponding to the first slip  
surface 246, which forms a pair of hemispherical grooves 256  
corresponding to the pair of the first ball 248 on the second slip surface  
254, and which forms a first inducing groove 258 connecting each of the  
25

first hemispherical grooves 256 with an annular shape;  
a first rotation shaft 260 which is fixed perpendicularly to the rotation area  
110 to be combined with the first corner hole 252, the second shaft hole  
242, the first compression spring 230 and the first shaft hole 214, which  
5 forms an annular groove 264 on its projected end, and which forms a first  
corner projection part 262 combined with the first corner hole 252;  
and a first e-shaped ring 270, which is combined with the first annular  
groove 264 in the upper part of the first shaft hole 214;

and

a clutch part comprising:

a second compression spring 310, which is inserted into the hinge area  
130;

a second rotation slip part 320, which is inserted into the hinge area 130  
15 outside of a second compression spring 310, which forms a third shaft  
hole 322 in its center, which forms a flat third slip surface 324 in one  
surface, which forms two or more second hemispherical grooves 326 on  
the position opposite the third shaft hole 322, which forms a second  
inducing groove 326 connecting the second hemispherical grooves 326  
20 with an annular shape, and which forms a second guide projection 329  
slidably combined with the second guide groove 134;

a second fixing slip part 330, which is inserted into the first hinge area  
130 outside of the second rotation slip part 320, which forms a fourth  
shaft hole 332 corresponding to the third shaft hole 322, which forms a  
25 fourth slip surface 334 corresponding to the third slip surface 324 on its

one side, which forms a pair of second balls 338 inserted into the second hemispheric groove 326 on the fourth slip surface 334, and which forms a second corner projection part 336 combined with the second corner hole 14 formed on the main frame 10 in its other side;

5 a second rotation shaft 340, which is rotatably combined with the fourth shaft hole 332, the third shaft hole 322 and the second compression spring 310, which forms a second annular groove 342 on its end, and which forms a clamping end 344 clamped with the corner projection part 336 in its back end; and

10 a second e-shaped ring 350, which is combined with the second annular groove 342 in the rotation area part 110.

## **【Claim 2】**

A cover hinge device of a mobile phone comprising:

15 a hinge cylinder 100 comprising:

a rotation area 110 opened upward; and

a second rotation area 140 which is opened upward, which forms a third guide groove 144 starting vertically and bent horizontally in a lower direction on its both sides, and which forms a first through hole 142 opposite to the rotation area 110;

20 a rotation part comprising:

a cylinder 210, which forms a hollow hole 220 opened downward, which forms a first shaft hole 214 on upper surface of the hollow hole 220, which forms a horizontal first guide groove 222 on inner surface of the

hollow hole, and which forms an arm 212 combined with a cover 20 in an upper direction;

a first compression spring 230, which is inserted into the hollow hole 220;

a first rotation slip part 240, which forms a second shaft hole 242 in its center, which forms a first guide projection 244 slidably combined with the first guide groove 222 in its outer circumferential surface, which forms a flat first slip surface 246 in a lower direction, which forms a pair of first balls 248 in the position opposite to the second shaft hole 242 on the first slip surface;

a first slip part 250, which forms a first corner hole 252 in its center, which forms a second slip surface 254 corresponding to the first slip surface 246, which forms a pair of hemispherical grooves 256 in the position corresponding to the pair of balls 248, and which forms a first inducing groove 258 connecting each of the first hemispherical grooves 246 with an annular shape;

a first rotation shaft 260, which is rotatably combined with the first corner hole 252, the second shaft hole 242, the first compression spring 230 and the first shaft hole 214, which forms a first annular groove 264 on its projected end, which forms a first corner projection part combined with the first corner hole 252; and

a first e-shaped ring 270, which is combined with the first annular groove 264 in the upper direction of the first shaft hole 214;

and

a clutch part comprising:

a third compression spring 400, which is inserted into the second rotation

area 140;

a rotation slip part 410, which is inserted into the second rotation area 140 outside of the third compression spring 400, which forms a fifth shaft hole 414 is formed on its center, which forms a flat fifth slip surface on its one side, which forms two or more third hemispherical groove 416 in the position opposite to the fifth shaft hole 414, which forms a third inducing groove 418 connecting each of the third hemispherical groove 416 with an annular shape, and which forms a third guide projection slidably combined with a third guide groove 144; and

a third fixing slip part 430, which is inserted into the second rotation area 140 outside of the third rotation slip part 410, which forms a first guide shaft rotatably combined with the fifth shaft hole on its center, which forms a sixth slip surface corresponding to the fifth slip surface 412 on its one side, which forms a pair of third balls 440 inserted into the third hemispherical groove 416 on the fifth slip surface 434, and which forms a third corner projection part 432 combined with a second corner hole 14 passing through the first through hole 142 to be formed on the main frame 10.

### **【Claim 3】**

A cover hinge device of a mobile phone comprising:

a hinge cylinder 100 including a rotation area 110 opened upward, and a third rotation area 150 which is opened upward, which forms a horizontal fourth guide groove 152 on its one side, which forms a second through hole 154 opposite to

the rotation area 110;

a rotation part comprising:

5 a first guide groove 222, which forms a hollow hole 220 opened downward, which forms a first shaft hole on the upper surface of the hollow hole 220, which forms a vertical first guide groove 222 on inner side of the hollow hole 220, and which forms an arm 212 combined with a cover 20;

10 a first compression spring 230, which is inserted into the hollow hole 220, a first rotation slip part, which forms a second shaft hole 242 in its center, which forms a first guide projection 244 slidably combined with the first guide groove 222, which forms a flat first slip surface 246 on its lower part, and which forms a pair of first balls 248 in the position opposite to the second shaft hole 242;

15 a first fixing slip part 250, which forms a first corner hole 252, which forms a second slip surface 254 corresponding to the first slip surface 246, which forms a first hemispherical groove 256 in the position corresponding to the pair of first balls 248 on the second slip surface 254, which forms a first inducing groove 258 connecting each of the first hemispherical grooves 256 with an annular shape, a first rotation shaft

20 260, which is perpendicularly fixed to the rotation area 110 to be rotatably combined with the first corner hole 252, the second shaft hole 242, the first compression spring 230 and the first shaft hole 214, which forms a first annular groove 264 on its projected end, and which forms a first corner projection part combined with the first corner hole 252; and

25 a first e-shaped ring 270, which is combined with the first annular groove



264 on the upper part of the first shaft hole 214;

and

a clutch part comprising:

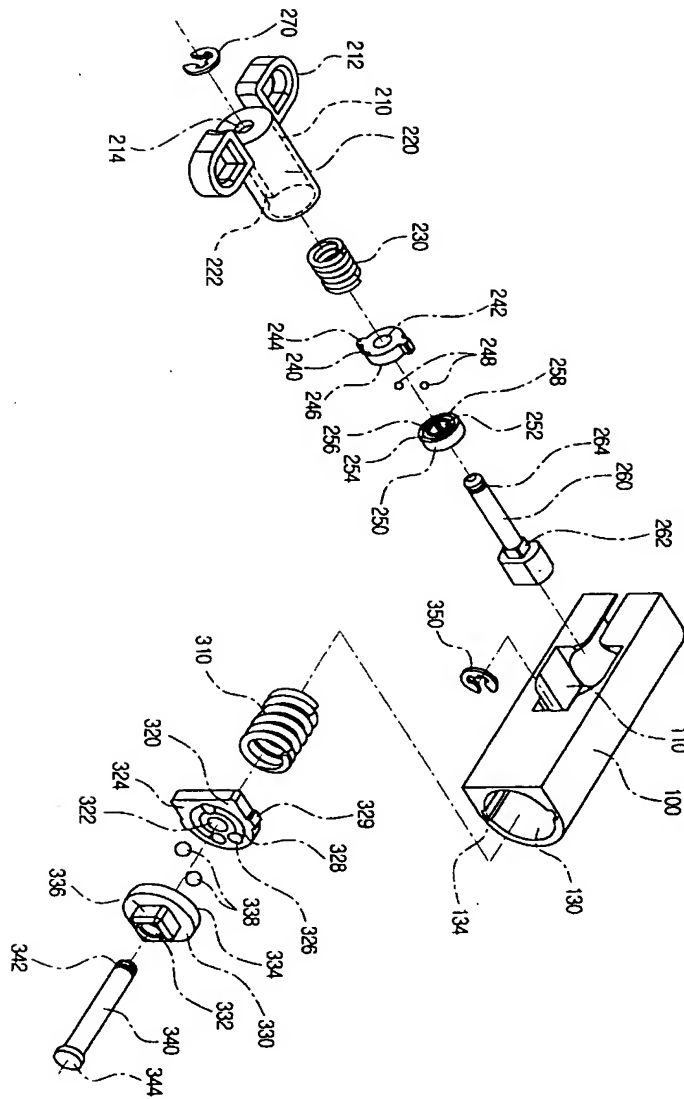
a fourth compression spring 500, which is inserted into the third rotation  
5 area 150;

a fourth rotation slip part 510, which is inserted into the third rotation area  
150 outside of the fourth compression spring 400, which forms a sixth  
shaft hole 514 is formed in its center, which forms a flat seventh slip  
surface 512 on its one side, which forms two or more fourth  
10 hemispherical grooves 416 in the position opposite to the sixth shaft hole  
414 on the seventh slip surface 512, which forms a fourth inducing  
groove 518 connecting each of the fourth hemispherical grooves 416 with  
an annular shape, and which forms a fourth guide projection slidably  
combined with a fourth guide groove 144; and

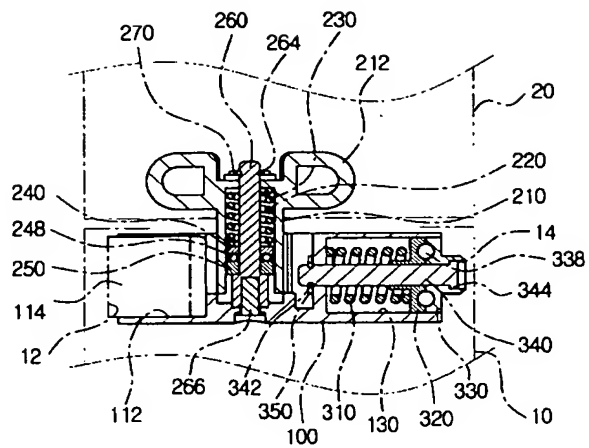
a fourth fixing slip part 530, which is inserted into the third rotation area  
15 150 outside of the third rotation slip part 410, which forms a second guide  
shaft 556 rotatably combined with the sixth shaft hole ion its center, which  
forms an eighth slip surface 534 corresponding to the seventh slip  
surface 412 on its one side, which forms a pair of fourth balls 540  
20 inserted into the fourth hemispherical groove 516 on the eighth slip  
surface 434, and which forms a fourth corner projection part 432  
combined with a second corner hole 14 passing through the second  
through hole 152 to be formed on the main frame 10.

[DRAWINGS]

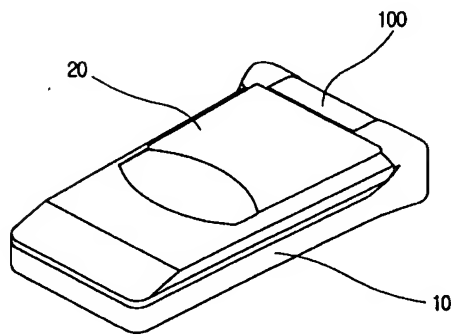
[FIG. 1]



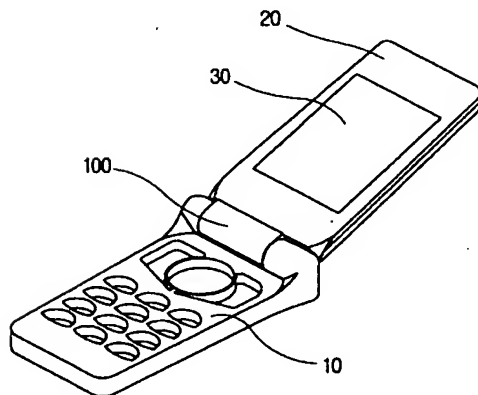
**【FIG. 2】**



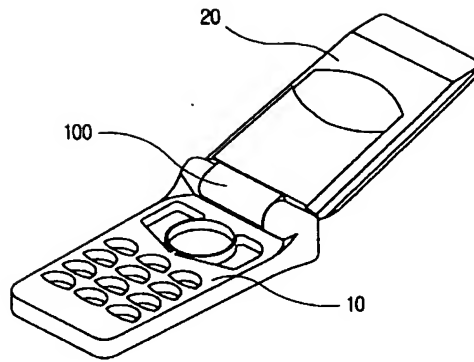
**【FIG. 3】**



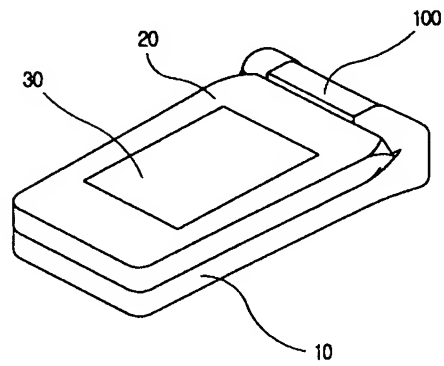
**【FIG. 4】**



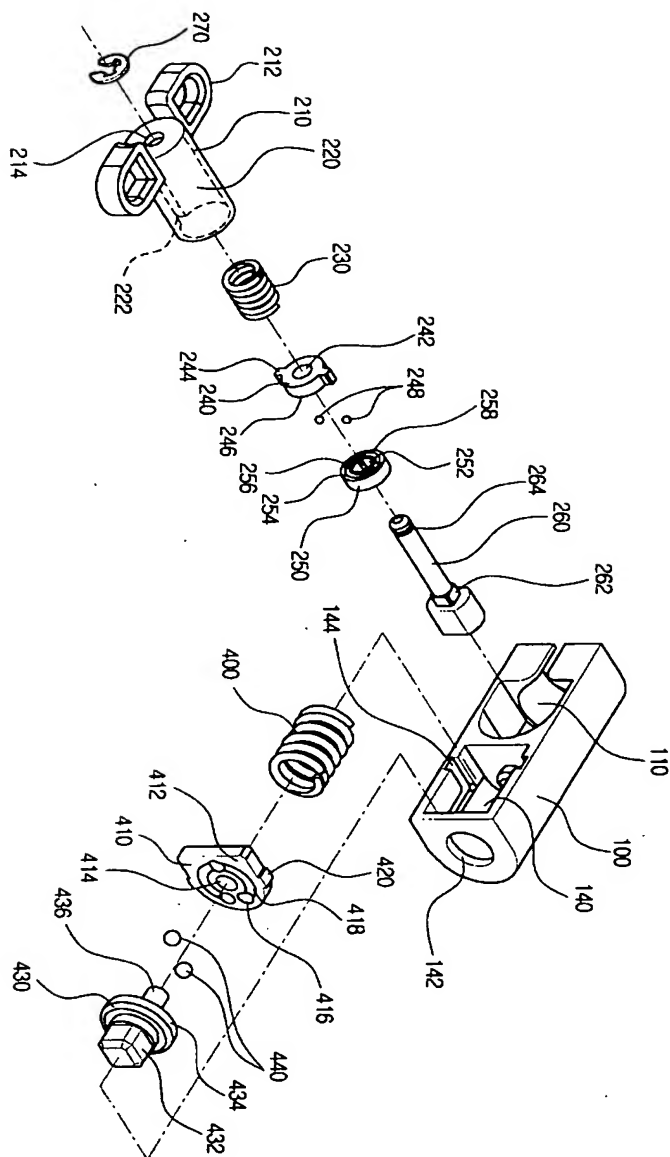
**【FIG. 5】**



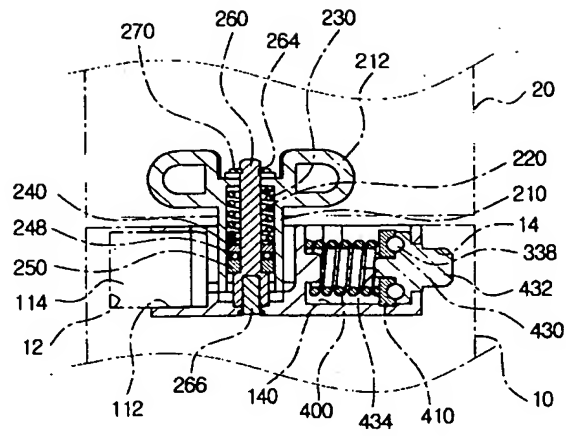
**【FIG. 6】**



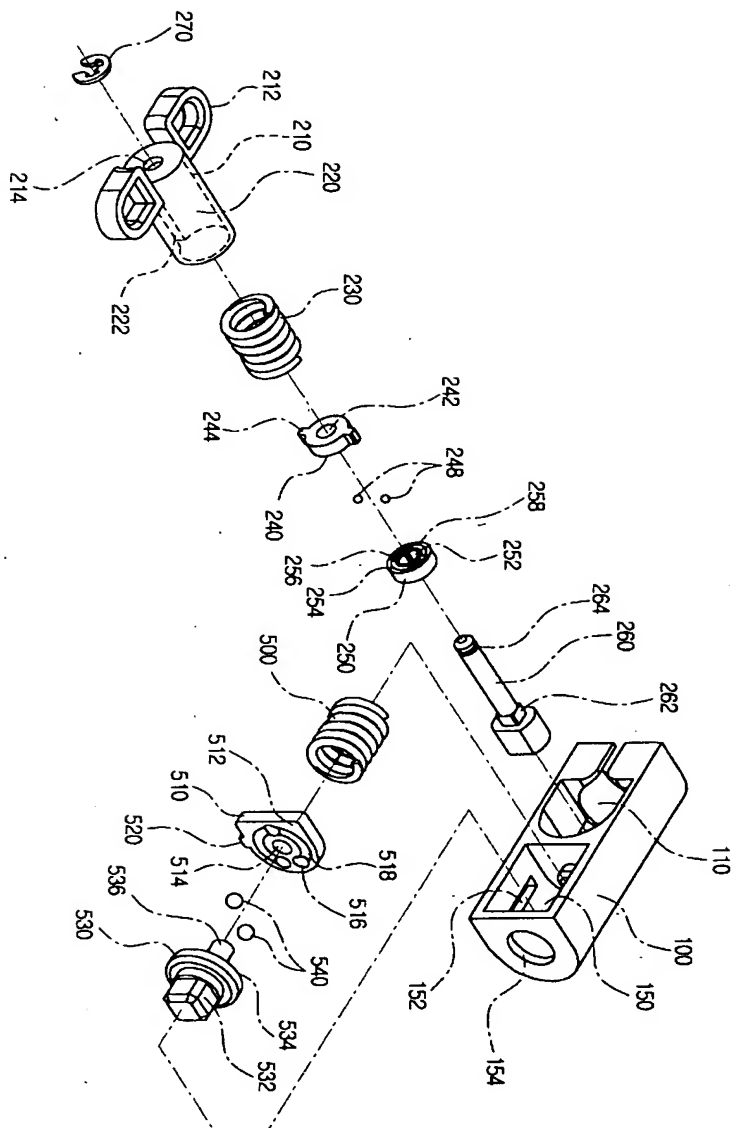
【FIG. 7】



**[FIG. 8]**



**[FIG. 9]**



**[FIG. 10]**

